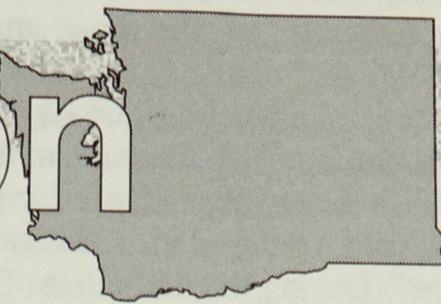


Washington



Statewide geographic information and GIS coordination in Washington State is currently led with an emphasis on policy by the Washington State Geographic Information Council, created by the Department of Information Services in early 1990. The council is an active group of representatives of state, local and federal agencies, Indian tribes, legislative members, academia, and the private sector. The council is a member of the Northwest Land Information Systems Network (NWLISN), and is participating with it in the development of a Spatial Data Index. The 1990 Growth Management Act directs the Department of Community Development to assist localities in planning efforts. The department is providing local planners with information on developing GIS and sources of digital data. The Department of Natural Resources (DNR) was the first and is the largest user of GIS of any agency in the state, and it is among the largest GIS user agencies in the country. Other state agencies also have GIS activities, including the departments of Wildlife, Ecology, Energy, Transportation and the Puget Sound Water Quality Authority. Various cooperative projects are underway between the natural resources agencies, including participation in the Water Resources Data Management Task Force, which was created by the legislature.

1

Origins of State Initiatives

Among the states, Washington State is one of the earliest and largest users of GIS. Mapping and geoprocessing efforts in Washington began in the Department of Natural Resources (DNR) in 1955 and has evolved to become one of the largest state-funded GIS programs in the nation. At that time, a mapping program for forest typing was initiated to assist in the agency's primary mission of public lands management. The maps contained general forest inventory as well as stream, road, public land survey, and state ownership data. Activity information records (such as records of timber cutting, planting and fertilization) kept as overlays to the maps were used by managers and regional field staff until 1972.

Automation of forest inventory and planning began in 1971 with the implementation of the

Gridded Resource Inventory System (GRIDS). This system was initiated to support "sustainable harvest forestry" and to enable managers to make forest harvest calculations from the GRIDS database and print out maps on a line printer, as well as accomplishment reports from automated activity records and general forest inventory reports. An orthophoto and soils mapping program for state forest lands was also initiated in the 1970s. The soils data was maintained on a Calmagraphics Mapping System. Other related information, including lease and ownership records, resided in different systems.

Natural resources and land use information coordination has been a goal in Washington since the early 1970s. At this time, the legislature granted DNR the authority to develop a "statewide land use database" and gave it responsibility for

“statewide base mapping,” but without regulatory authority or funding. A State Mapping Advisory Committee (SMAC) was organized in 1973 in response to the base mapping legislation. SMAC met regularly until the late 1980s. In 1982, 11 federal agencies signed a memorandum of understanding with the state of Washington to “establish statewide guidance for plans and programs for interagency data management and inventories.” During the mid-1980s, federal participation dwindled. State agencies shared experiences and information on a technical level, but agency commitment to coordination and sharing was not directed by agency leaders.

In 1979, DNR completed a preliminary requirements statement for new GIS. This study concluded that GRIDS and other systems must be integrated, that automated planning should be made available, and that rapid data updating should be possible. A formal needs assessment and system requirements statement was conducted in 1982. After an RFP was issued and an award granted, system installation began in late 1983. This work served as the basis for a database model that meets the requirements of the Forest Land Management Program adopted by the Board of Natural Resources in 1984 to help manage the state’s forests for the future. The GIS became known as the GEOgraphic Multi-use Analysis and Planning System (GEOMAPS) and is operated in DNR’s Information Management Division (IMD), although system use is decentralized. While operating centrally at DNR’s main office in Olympia, divisions and regions began accessing it through phone lines dedicated for that purpose. DNR expansion of the system continued in the 1980s.

Mapping and geoprocessing efforts in Washington began in the Department of Natural Resources in 1955 and has evolved to become one of the largest state-funded GIS programs in the nation.

Proposed legislation to develop a self-supporting state GIS service bureau at DNR was drafted in 1981, but the legislation died in committee. Also in the early 1980s, DNR initiated a memorandum of understanding with several state and federal agencies to facilitate the exchange of geographic data. Agencies that began access of DNR’s GIS included the Washington Department of Ecology, the U.S. Soil Conservation Service (SCS) and the U.S. Forest Service (USFS). Cooperative data development agreements were initiated with vari-

ous agencies as well. A GIS training center was established in 1987 and is used by other agencies.

A State Cartographer position was established in May, 1979 with funding from the U.S. Geological Survey (USGS) and DNR. Originally a USGS position (until 1982), it became a position within DNR in 1984, retaining funding support from USGS. The original purpose of this position was to facilitate coordination and building of the state’s cartographic resources. Beginning in 1987, the position evolved into the role of marketing DNR’s conventional and digital cartographic data, aerial photography, orthophotographs, and related natural resources geographic data. However, statewide coordination efforts were also accomplished during this time with DNR’s leadership. For example, following a lull of activity, SMAC was rejuvenated in 1987 when a State Cartographer was hired. SMAC met regularly until the end of the decade and conducted various activities, including a GIS Symposium on September 26, 1989. In addition, SMAC sponsored a survey of counties in late 1988 regarding their geographic information efforts. SMAC responsibilities have since been turned over to the Washington State Geographic Information Council.

Other state agencies began acquiring GIS capabilities as early as 1983. The Department of Wildlife began use of remote sensing in 1975 and GIS in 1986. The Department of Ecology began use of GIS in 1988 to conduct watershed basin-specific projects such as the Puget Sound River Basin Project. The project was initiated with state and federal agencies. A Hydropower Planning Database was initiated in 1987 with federal agencies and the state Department of Wildlife, the State Energy Office, and the Northwest Power Planning Council. Other departments, including the Department of Agriculture, the Employment Security Department, and the Washington Utilities and Transportation Commission also began use of GIS for agency purposes. The Department of Transportation, a long time user of CAD, formed a Geographic Services branch to centralize and coordinate all geographic information activities in the late 1980s.

During the same period, federal agencies were rejuvenating coordination activities. Agencies in the Pacific Northwest strengthened their history of coordinated work. For example, the Washington Department of Wildlife and the Oregon Department of Fish and Wildlife sponsored a thematic mapper evaluation study conducted in 1986 by the University of Washington’s Remote Sensing Applications Laboratory. A state and federal agencies group, the Northwest Land Information Systems Network (NWLISN) was

established in August, 1987 through a multi-agency agreement of agencies in Oregon and Washington. Beginning in 1988, a pilot test was conducted by NWLISN and DNR for the Stillaguamish Watershed, the Puget Sound Water Quality Authority, and 14 other organizations to help promote the potential for data exchange. Other state geographic information coordination groups were also formed. A GPS Users Group was created in 1988 and was affiliated with the SMAC. The Washington Geographic Working Group (WG2) was also formed in 1982 by the agencies working with and interested in GIS. These efforts resulted in significant progress, but were limited by lack of funding and support of agency leaders for statewide needs.

The Department of Information Services (DIS) was created by the legislature in 1987. Its first director initiated interest in GIS in 1988 in response to increasing agency-level requests and activities. DIS considered taking a coordination role regarding geographic information in early 1989. The Employment Security Department submitted a proposal to DIS on September 1, 1989 to sponsor a project to develop a "statewide comprehensive GIS strategy," but funding was not awarded. At about the same time, the DNR proposed that a statewide Geographic Information Council be established that includes executive-level representatives who could commit their agencies to GIS efforts. After consulting with several agencies active in GIS and the legislature, DIS undertook a role in statewide GIS coordination efforts and established a steering committee composed of seven state agency representatives late in 1989. A DIS staff person was designated to coordinate the group, which evolved in early 1990 to become the Washington State Geographic Information Council.

Coordination Efforts, Groups and Activities

Statewide geographic information and GIS coordination is currently led by the Washington State Geographic Information Council (WSGIC), which maintains an emphasis on statewide policy issues. According to legislation adopted in the 1970s, the Department of Natural Resources (DNR) was designated as the lead agency to develop a "statewide land use database" and was given authority for "statewide base mapping," although funding was not provided for these purposes. DNR was the first and has the largest GIS facilities of any state agency. DNR housed Washington's State Cartographer position, which has served in a coordination role regarding manual

and automated geographic information, and more recently in a marketing role for DNR's products (see **Origins of State Initiatives**). More recently, state directives which include legislation and executive orders have been adopted, influencing specific kinds of geographic information, growth management, and information access and privacy.

In response to various GIS efforts and activities in state agencies, WSGIC was formed by the Department of Information Services (DIS) in March 1990, and serves as a management-level forum for exploring issues and alternatives, exchanging information, developing and recommending standards and promoting cooperative data efforts. Formerly, a variety of groups were working with geographic information and GIS coordination, including a State Mapping Advisory Committee (SMAC), the Washington Geographic Working Group (WG2), and a GPS Users Group, but their functions were assumed by the council during 1990 (see **Origins of State Initiatives**).

The council defines its purpose as one which will "provide direction for automated geographic information needed to improve the delivery of government products and services in the State of Washington." Its goals are identifying issues; recommending actions; fostering cooperation among all levels of government, tribal and private entities; formulating and recommending standards for data architecture, quality, accuracy, resolution and maintenance; promoting data sharing; and serving as a forum for the exchange of educational information and the development of mutual interests.

WSGIC includes senior management level representatives of the following departments and agencies: DIS, DNR, Department of Ecology, Department of Wildlife, State Parks and Recreation Commission, State Energy Office, Department of Health, Puget Sound Water Quality Authority, Department of Community Development, Washington State Patrol, Department of Transportation, County Road Administration Board, Employment Security Department, Department of Social and Health Services, Superintendent of Public Instruction, Department of Personnel, Office of Financial Management, State Library, and the Washington State Redistricting Commission. In addition, the Council has one representative from the Senate and will have one representative from the House. Federal agencies are represented by USGS; academia is currently represented by Central Washington University; and local governments are represented by Pierce County and the City of Spokane. Indian tribes are represented by the Northwest Indian Fisheries Commission, which coordinates council activities with all 26 tribes in Washington. There is also

a representative of the Tulalip Tribes on WSGIC. Efforts are underway to add private sector representation. Washington is one of the first states in the country to include tribal representation in their geographic information coordination efforts. The tribes are actively involved in GIS, the council, multi-organizational cooperative efforts, and other related activities.

The council is chaired by the manager of DNR's Division of Information Management. A representative of the Department of Wildlife is chair-elect for 1993, and a representative of Central Washington University is secretary. DIS continues to dedicate half the time of a staff member to serve as Executive Coordinator and DIS's member of the council. Interagency efforts regarding GIS are also initiated and coordinated as part of this role.

The council adopted its most recent charter and bylaws on June 12, 1991. It sets out the goals and objectives of the council, as well as its membership, stipulating that voting members are representatives of state and local governments, the legislature and higher education. Ex-officio members include the representatives from the federal government, private sector and the tribes. The council is very active, meeting approximately every five weeks. In addition to official members, staff from member and other organizations participate in work groups and other council activities. A two-day planning meeting was held in January, 1991 to plan the year's activities.

In early 1991, the council established an Executive Committee, which includes the council's three officers and the executive coordinator. This committee also serves as a planning and steering group for the council. The council established three major issue areas, and subcommittees and work groups within each area in order to focus efforts. In issue areas concerning management, however, there is not a subcommittee or work group at this time.

Within the Basic Issues area, two groups were formed. The first group is the Basic Issues Subcommittee which the council directed to develop a limited set of alternatives in which governments coordinate GIS. Accordingly, a GIS Framework Alternatives Matrix was developed in the spring of 1991. It includes GIS activities and functions on the vertical axis and three alternatives on the horizontal axis. Subcategories included in the matrix, each with recommended ranges of actions, include the following:

- **Data**, including a development of a directory, repository, and guidelines, as well as efforts to develop data and distribute it.
- **Interagency coordination**, including the development of boilerplate agreements between federal, state, tribal, local and private entities; as well

as facilitating the generation of specific agreements between such entities.

- **Funding**, including providing monies for specific projects; facilitating and coordinating fund seeking efforts; and cost recovery efforts including legislation and accounting.

- **Technical assistance** includes training and system acquisition assistance, such as developing an expanded *Buyer's Guide*.

Three alternatives were described in the matrix, with the recommended alternative requiring some funding, structural changes, and actions of council member groups. The council is planning to further develop and implement these or related recommendations.

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The Open Records Work Group was organized to address the accessibility and pricing of information. Current efforts include evaluating current requirements and procedures by which agencies charge fees for information. Another concern is the liability of information. Model memoranda of understanding and proposed legislation currently under development will include provisions to address these issues.

Within the Information Issues area, several groups have been established. One group is the Standards Subcommittee, which is currently evaluating federal standards and conducting a survey of standards used by the council's members and other agencies. Priorities for standards are also being established through the survey effort.

This issue area also has other work groups, including the GIS Directory Work Group. This group was formed at the council's first meeting in 1991, when priorities for the year were established. An automated GIS data directory that includes data layers, software and equipment, was selected as the top priority. Early in 1991, the group conducted an analysis to create the directory. User communities and the scope of the directory was defined, and various data collection modes were considered. It was decided that the state would employ an enhanced version of the system being developed by the Northwest Land Information Systems Network (NWLISN) for its *Spatial Data Index* (see below). The council adopted a resolution that all members will participate by providing information. More than 15 member

agencies agreed to contribute up to \$500 to fund the project.

The council also directed the GIS Directory Work Group to develop a list of databases which could be used by the legislative caucuses in the Legislative Redistricting Project. This effort was initiated in order to assist and enable legislators and other executive personnel to learn about GIS and its applications.

The NAD83 Work Group is considering issues associated with converting from the North American Datum of 1927 to the 1983 datum, and how to best accomplish conversion to this reference system, including GPS issues. The state legislature adopted the new datum as the official surveying and mapping reference datum for the state effective July 1, 1990. In February 1991, the council recommended that NAD83 be used as the only spatial reference system for GIS in Washington.

At the encouragement of council participants from the Puget Sound Water Quality Authority and the Department of Fisheries, an Estuarine Issues Work Group was established to identify issues and develop recommendations. Formed in the fall of 1990 with over 25 participants, subgroups were organized that include Habitat, Shoreline and Bathymetry. The Working Group and the subgroups are identifying data development and applications related to estuaries to improve data sharing and reduce redundancy and incompatibility. The group prepared the report entitled *Recommended Estuarine Data Standards* in May, 1991 and presented its findings and recommendations to the council.

Washington has other groups coordinating geographic information. The Water Resources Data Management Task Force was created by the legislature in 1990. It includes various agencies working together and using GIS to assist in development of an information management plan for water resources planning (see **GIS in State Government**, Department of Ecology).

The Northwest Computer Aided Mapping Association (NWCAMA) is a non-profit organization providing a forum for users and vendors of GIS and computer-aided mapping. An active group, it conducts two major meetings per year. Its fall meeting was co-sponsored by the council and included presentations by state, federal and local agency representatives about their GIS activities.

Federal and Pacific Northwest Relations

A variety of cooperative efforts have been underway involving the states of Washington and Oregon, and federal agencies active in the Pacific Northwest. Washington is participating with these agencies in the Northwest Land Information Systems Network (NWLNISN), which was es-

tablished in August, 1987 through a multi-agency agreement to provide natural resources agencies with an organized way of sharing data. This agreement was modified in September, 1990 to recognize the Washington State Geographic Information Council as Washington's official representative to NWLNISN.

A current major effort of NWLNISN is development of a *Spatial Data Index* by Portland State University under contract and with funding provided by participating agencies. This project is developing an index of digital maps and data. WSGIC and the Oregon State Map Advisory Committee decided to maintain the Spatial Data Index individually within each state, but will utilize the same format and design (see Oregon profile). The State Library will be the repository for Washington's Index.

The Water Resources Data Management Task Force includes various agencies working together and using GIS to assist in development of an information management plan for water resources planning.

One cooperative project is development of the Columbia River Gorge National Scenic Area's development plan, an area on the border between Oregon and Washington. The plan is being prepared by the U.S. Forest Service, with some work conducted by the Oregon GIS Service Center and the Washington Department of Natural Resource's GIS (see Oregon profile). Washington agencies have also participated with the Bonneville Power Administration (BPA) and the states of Idaho, Montana and Oregon to develop a database on the impacts of potential sites for new hydropower facilities (see **GIS in State Government**, Energy Office). In addition, the Pacific Northwest Stream Information System is being built with the USGS, U.S. Environmental Protection Agency (EPA), Bonneville Power Administration, and the Northwest Power Planning Council.

Washington has one of the longest histories of memoranda of understanding regarding geographic information between state and federal agencies of any state in the country, and has adopted a goal of further agreements to provide for data sharing. Before 1990, agreements were signed between DNR and the Department of Transportation, NWLNISN, and other state and federal agencies. In September 1990, a series of agreements and no-

tices was approved by the council and its membership to enable the council to serve as the state's official contact regarding geographic information. These documents included notification to USGS that the council is the official contact determining Washington's mapping priorities. The Open Records Work Group is developing model memoranda of understanding to facilitate data sharing among agencies and levels of government.

Current Activities

Twelve organizations including federal, state, local and tribal governments and the private sector contributed over \$100,000 to participate with USGS in the National Aerial Photography Program to conduct an overflight of the eastern part of the state in 1991. Each of the entities will receive discounts of up to 50% for the purchase of photography as a result of the project. Photography of the western part of the state was completed in 1990.

The council is considering sponsoring the WASHNET project, an effort to coordinate enhancements to the Census files, including upgrading, enhancing and maintaining a statewide address range and street segment database based on Census Bureau TIGER files. A staff report proposed that this effort was needed to support a variety of applications, including Enhanced 911 service, growth management, transportation planning, economic development, social and health program services, education and training services, and other programs in both state and local governments. Several projects to upgrade these files have been underway. The Washington State Redistricting Committee is spending \$100,000 to update address range and street segment files for the state's counties. In addition, some local area consortia have developed projects including extending address range coverage, enhancing the appearance of maps, and improving geodetic control in Census DIME areas. Accordingly, the council feels that prompt action may be needed to develop a statewide file and to eliminate costly duplication of effort.

As proposed, WASHNET would contain street name and type, address range, five digit ZIP code, 1990 Census tract number and incorporated place code, and latitude and longitude for start and end points of street "arcs." It would also include existing Census Bureau TIGER files as updated by the Redistricting Commission and local governments, and conform to standards of the Census Bureau for updating files. Documentation, checking and edgematching would be included to assure that updates fit into the statewide network.

The council also served as coordinator of information gathering for the *State Geographic Information Activities Compendium*, and with

assistance from the author identified 11 states to survey concerning GIS issues. Six issue areas were identified, and a telephone survey was conducted within these states by the council's current chair, who represents DNR. The results were used to help the council in its January, 1991 planning efforts.

Legislation

Legislation adopted in 1991 will potentially impact geographic information activities in the state, and other legislation has also been proposed. For example, House Concurrent Resolution 4418 established a joint select committee to conduct a study on the adequacy of state laws governing the public's right to obtain access to government records. House Bill 5906 amended the public disclosure law to provide protection for names and addresses of victims of domestic violence from disclosure to the public. This bill establishes the precedence of privacy protection. House Bill 1222, also adopted in 1991, requires school districts to prepare for divisions or redivisions for internal districts after receipt of Census data. This requirement could increase the pace of digital data development. Engrossed Substitute House Bill 2932, adopted in 1990, directed the development of a comprehensive water resource data program (see **GIS in State Government**, Department of Ecology).

Proposed bills in 1991 included creation of a geographic information task force to be convened by DIS. The intent of the bill was to prepare recommendations, including organizational structure, that would foster development and exchange of geographic information, procedures for ensuring accuracy, quality, and integrity of geographic data, mechanisms for funding data development, and other related areas. It was recommended that the bill be amended to include a proposed task force with the same composition as that of the council; but the bill died in the House Appropriations Committee. A bill proposed by Pierce County provided that local governments active in GIS could recover portions of the developmental and maintenance costs of their GIS, and prohibited commercial use of geographic information obtained from local governments. The bill passed the Washington House but died in a Senate Committee. Another proposed bill would have established a joint select committee of state and local representatives, among others, to study the state's laws, policies, and procedures for protecting citizens from invasion of privacy by government and private enterprise concerning the collection, use or sharing of personally identifiable information. This bill died in the Senate Law and Justice Committee. While these bills were not adopted, they helped to edu-

cate legislators and other officials about GIS and public/private records issues; and related proposed bills are expected in the future.

Regional and Local Government Relations and Programs

The comprehensive *1990 Growth Management Act* requires specific cities and counties to engage in a wide range of intra-and inter-jurisdictional planning activities, including development of comprehensive plans. The act also directed the Department of Community Development (DCD) to contract with DIS to form an "advisory group consisting of representatives from state, local and federal agencies, colleges and universities, and private firms with expertise in land planning and GIS."

Provisions of the act include requiring certain and allowing some high growth and populated counties to designate urban growth areas and to conduct capital facilities planning efforts. Comprehensive plans must include public facilities, utilities and transportation elements, with zoning and other implementation regulations also called for in the act. The act directed DCD to develop a program to assist local governments in conducting these required planning efforts. The act also directed the department to "assist in the process of inventorying and collecting data on public and private land for the acquisition of data describing land uses, demographics, infrastructure, critical areas, transportation corridors physical features, housing and other information useful in managing growth in the state."

In 1988 Washington conducted one of the most comprehensive surveys of county government level geographic information activities of any state in the country, and also uniquely made the results available in automated form through the DNR and USGS affiliate offices.

The act also provides for technical assistance and grants for local governments to implement the act. Almost \$6.5 million was provided to the 15 counties required to participate in planning efforts; \$600,000 was awarded to additional counties; and almost \$375,000 went to the Department of Ecology for its wetlands program. An additional \$1 million was provided for technical assistance, and over \$500,000 was used for grants for economic development. As part of its local technical assistance efforts, a *Guide to Designing an Urban*

Growth Area was prepared in October, 1990 under contract. In addition, *Minimum Guidelines: A Blueprint for Local Planning* was prepared to help local governments classify and officially describe lands that must be protected under the act. The 15 affected counties were also required to conserve natural resource lands and protect critical areas by September 1, 1991. Many of the decisions are left up to counties and cities, especially as compared to other states with growth management legislation. *Minimum Guidelines to Classify Agriculture, Forest, Mineral Lands and Critical Areas* were prepared as part of the Washington Administrative Code to assist counties in the classification process.

The ability of local governments to comply with the act may be strongly influenced by each community's ability to access, manipulate, store, and update growth management data. As part of its efforts to meet the requirements of the act, DCD conducted a survey of local governments in the spring of 1991, which included some questions about GIS. DCD determined that a wide range of data management capabilities exists among local governments, and that many are interested in upgrading their automated data management tools and systems. Accordingly, DCD decided to develop a *Local Government Guide to Developing or Enhancing Growth Management Data Automation Capability* that assists local governments in their planning efforts. The Request for Proposals for the guide required that it include, among other components, guidance on building data layers that are compatible with state mapping data, data sharing between departments within a local government and special districts, and access to existing public and private sources of data, especially if it can be used with GIS. It also required that recommended strategies be identified and described in the guide. The guide was made available in the fall of 1991. Funds provided to localities can be used for local digital geographic information and GIS development.

DCD is working actively with other state agencies to gather and organize data that can be used with GIS. Growth management is seen as a method to integrate a variety of data. Efforts are also underway in WSGIC to more closely coordinate activities with localities. Counties and cities are represented on the council, which was chaired by the director of Pierce County's Information Services Department in 1991. For example, one of the council's monthly meetings in 1991 was held in conjunction with the annual meeting of the Association of County/City Information Services.

In 1988, Washington conducted one of the most comprehensive surveys of county government level

geographic information activities of any state in the country, and also uniquely made the results available in automated form through the DNR and USGS affiliate offices. SMAC had previously identified a need to know what counties were involved in automated large-scale mapping and GIS activities. A questionnaire was developed with and distributed by the Washington Association of County Officials. The survey included questions about automated mapping systems and technology in use, GIS, geographic reference schemes, manual mapping systems, remonumentation plans, and others. The DNR State Cartographer and other staff compiled the responses. The results were made available in WordPerfect 5.0 and ASCII format from the Earth Science Information Center Affiliates (ESIC) of USGS located in Washington state.

3

GIS in State Government

Many state agencies in Washington have GIS activities. The **Department of Information Services** (DIS) became involved in geographic information coordination and GIS efforts in late 1988. DIS was created by legislation in 1987, combining statewide operations of data processing and telecommunications with policy and planning for information technology within one organization. Formerly, policy and planning functions were conducted by Washington's Data Processing Authority, established in 1973. Compared to central information technology agencies in other states, Washington's DIS is one of the most comprehensive and powerful, with its specific legislative directive and cabinet level status. DIS reviews agencies' feasibility studies and information technology plans. It also provides oversight on information technology projects in state agencies and academic institutions.

DIS has assisted in GIS coordination since 1989, with increased activity since early 1990. One of DIS's responsibilities is fostering and facilitating the sharing and administrative coordination of data. To serve in this role where GIS data is concerned, DIS created a GIS Steering Committee in late 1989. Upon the committee's recommendation, DIS established the Washington State Geographic Information Council in March, 1990. DIS dedicates approximately half of the time of a staff member to work on coordination activities, including support for the council. Other DIS staff participate in some of the council's work groups. DIS led the council's efforts to gather \$103,000 in state matching funds for participation in the U.S. Geological Survey's (USGS) National Aerial Photog-

raphy Program (NAPP) to conduct aerial photography of eastern Washington in 1991. DIS contributed \$2,500 to this effort. DIS has no plans to implement GIS capabilities in-house at this time.

Another role of DIS involves providing data resource management technical expertise to agencies on a cost-recovery basis and assisting task forces. For example, DIS has provided such assistance to the Department of Ecology, the Office of Financial Management, and the Water Resource Data Management Task Force. DIS is interested in GIS as a rapidly emerging, useful technology. To assist DIS and the state to learn more about this technology, DIS initiated an internal GIS research and assessment project, known as the Pesticide Application GIS demonstration project. One DIS staff member is involved on a part-time basis. The purpose of the project is to learn about GIS.

The Washington Legislature passed House Bill 2222 in April 1989, requiring pesticide applicators to keep records concerning their use. U.S. EPA's Region 10 and WSDA initiated the Pesticide Application Record Data Base Project in June of that year as a way to facilitate the use of these data by state agencies involved in resource evaluation efforts and management decision processes. A variety of agencies are involved in the project, including the Departments of Ecology, Agriculture, and Health, as well as U.S. EPA, USGS and Thurston County.

The overall purposes of the project are to design (Phase I) and demonstrate (Phase II) the utility of a spatially-oriented pesticide application database, and to create an information resources management (IRM) model for pesticide data. One design requirement is that the database system be able to provide information to be used with GIS to allow pesticide data to be combined with other data layers, such as hydrogeological susceptibility maps or public water supply well locations. Phase I was completed by USGS's Water Resources Division in Tacoma. Phase II was underway beginning in 1991. This phase includes testing and evaluating the database and record collection system, demonstrating the utility of the database for pesticide management and resource evaluation, and removing incompatibilities between the USGS database and that of the Washington State Department of Agriculture (WSDA) to enable WSDA data to be uploaded to the USGS database. In May 1991, U.S. EPA showed maps of test data and the kinds of pictures that would be possible with combining pesticide data with other data such as that on groundwater. As part of this process, a survey was conducted in May and June to determine what information each participant might want, how

they would use it, and how they would wish to access it.

The **Department of Natural Resources** (DNR) has the largest GIS usage of any of the state's agencies, and also has one of the largest and oldest department-wide GIS in any state government. DNR's GIS continues to be particularly significant as virtually all financial support is from state trust land management funds. Because DNR is a "proprietary as well as a government agency; it operates as a quasi business, generating revenue." Public lands management is the primary function of DNR and GIS used by the agency. Its responsibilities include management of three million acres of state uplands held in trust for forest, agriculture, urban and recreation use. DNR's primary mission is to productively manage these trusts to provide financial support to state institutions (mainly schools) through lease of lands and sale of timber. Another two million acres of land covered by water (rivers, lakes, Puget Sound, and coastal lands out to the three mile limit) are part of DNR's resource management responsibility.

GIS activities in the agency are guided by a Resource Mapping/GIS Users Council, which reports to the Executive Management of the DNR. The role of the group is to prioritize the mix of GIS products and services. It consists of mid-level managers in other DNR divisions, and meets regularly in this regard. In order to facilitate intra-agency coordination, GIS Coordinators exist in each section and in each region to serve as liaisons with DNR's GIS section. The coordinators meet twice a year. The Geographic Information Management Team coordinates operational activities and develops external agency direction on GIS.

Geographic information is an established part of DNR's day to day activities. It is used in planning and recording the activities of the business. Functions include systems development, data management, training, consulting, and computing, which are centralized functions in the DNR's **Information Management Division** (IMD); while system use is decentralized. GIS support is mainly provided by ISD's Geographic Information Section. Mapping activities are also underway in the Division of Engineering's Resource Mapping Section. IMD serves as a service bureau for other divisions, providing project support for the use of geographic information computing services. It entails setting up user-identification numbers, determining equipment needs, and providing technical, analytical, and methodological support for regions. IMD also represents DNR on the Washington State Geographic Information Council, and its director is its Chair. IMD informally provides assistance to other agencies regarding GIS. By statute, the Public Land Survey Office, with eight

staff, is located in DNR. All land surveys in the state must be registered in this office.

IMD administers DNR's spatial databases. IMD provides structure and process to help assure that all stored data meet the standards of accuracy, integrity, and compatibility set by the agency, including its department-wide *Data Standards and Procedures* document. This document provides for naming standards, including procedures, structure, and abbreviation; data format standards; and data documentation standards, including dictionary maintenance and access. It maintains and coordinates the development of GIS user process documentation and summary descriptions. It develops and maintains GIS documentation guidelines and standards, with the goal to provide effective ways of providing information to our users.

DNR has invested close to \$12 million in GIS. Trust land and general fund revenues have been the sole source of funding. Of this total, \$2 million has been invested in hardware, \$6 million on data, and another \$4 million on support activities. Its annual budget for GIS is approximately \$1,750,000. Future funding is expected to be less than recent years.

IMD's staff of 85 includes 28 staff members allocated for GIS work. Another seven staff members in the Engineering Division work with GIS. In addition, the equivalent of another 18 full-time staff members use GIS as part of their program missions, and another 150 use GIS on a regular basis. DNR uses data processing-related job descriptions for GIS, and the classifications in use specify GIS.

DNR established a GIS training center in 1987. Courses are primarily intended for DNR staff, but other state employees can take classes as well. Day-long courses are provided in Introduction to Primos and GIS, Info I, ARC Concepts, ARCEDIT, ARC Commands, ARCPLOT, Advance Display: Custom Map and Report Creation, and INFO II. Self study courses are also provided. IMD assesses training needs of GIS users, coordinates GIS training requests, and evaluates new materials and aids as they become available, incorporating them when appropriate.

DNR's GIS uses ARC/INFO software on a dedicated Prime 6550. It operates on-line at DNR's central office in Olympia. DNR's divisions access the system in the headquarter office, and its seven regional offices utilize work stations connected via modems. In total, 45 remote sites access the system, including state agencies such as the Department of Ecology, and federal agencies including the U.S. Forest Service (USFS) and the U.S. Soil Conservation Service (SCS). The DNR is expanding its GIS network to include

ARC/INFO on UNIX workstations.

DNR's GIS uses a variety of data layers, some with statewide coverage, and others covering the lands it manages, or regulates. Base information includes political and administrative boundaries, state and county ownership codes, resource ownership codes, and the Public Land Survey System (PLSS) network, collectively referred to as POCA. Land use and vegetative cover data for all parcels managed by DNR are also available, including attributes such as polygon numbers, species codes, physical measurements of timber and management assignments collectively known as Land Use/Land Cover (LULC). Soils data on state and commercial forest lands are included. Data on specific forest tree seed lots managed by DNR are also included. Efforts are underway to transfer the Washington coordinate system from NAD27 to NAD83. This project will affect the entire GIS database. A project to automate detailed forest roads and hydrology is about 60% complete. In addition, digital elevation data needs assessments are beginning.

The **POCA (Public Land Survey System, Ownership, County, Administrative)** data layer is an integrated set of geographic-referencing data covering the entire state. It contains the boundaries of DNR administration, county, ownership and public land survey. Current efforts are to add federally-owned data to the system. It allows other spatial data (i.e. inventory) to be accessed and analyzed within these areas. POCA data is derived from land surveys, orthophotos, USGS 7.5 quadrangles, and DNR tract books.

The **LULC (Land Use/Land Cover)** data layer includes land use, land cover, and natural resource inventory summary data on uplands managed by DNR. LULC data are updated by the seven regions and includes production, archiving and editing responsibilities. Data is generalized on a stand-by-stand basis. LULC data are collected from aerial photography and field survey notes, and tied to the POCA data layer for spatial reference.

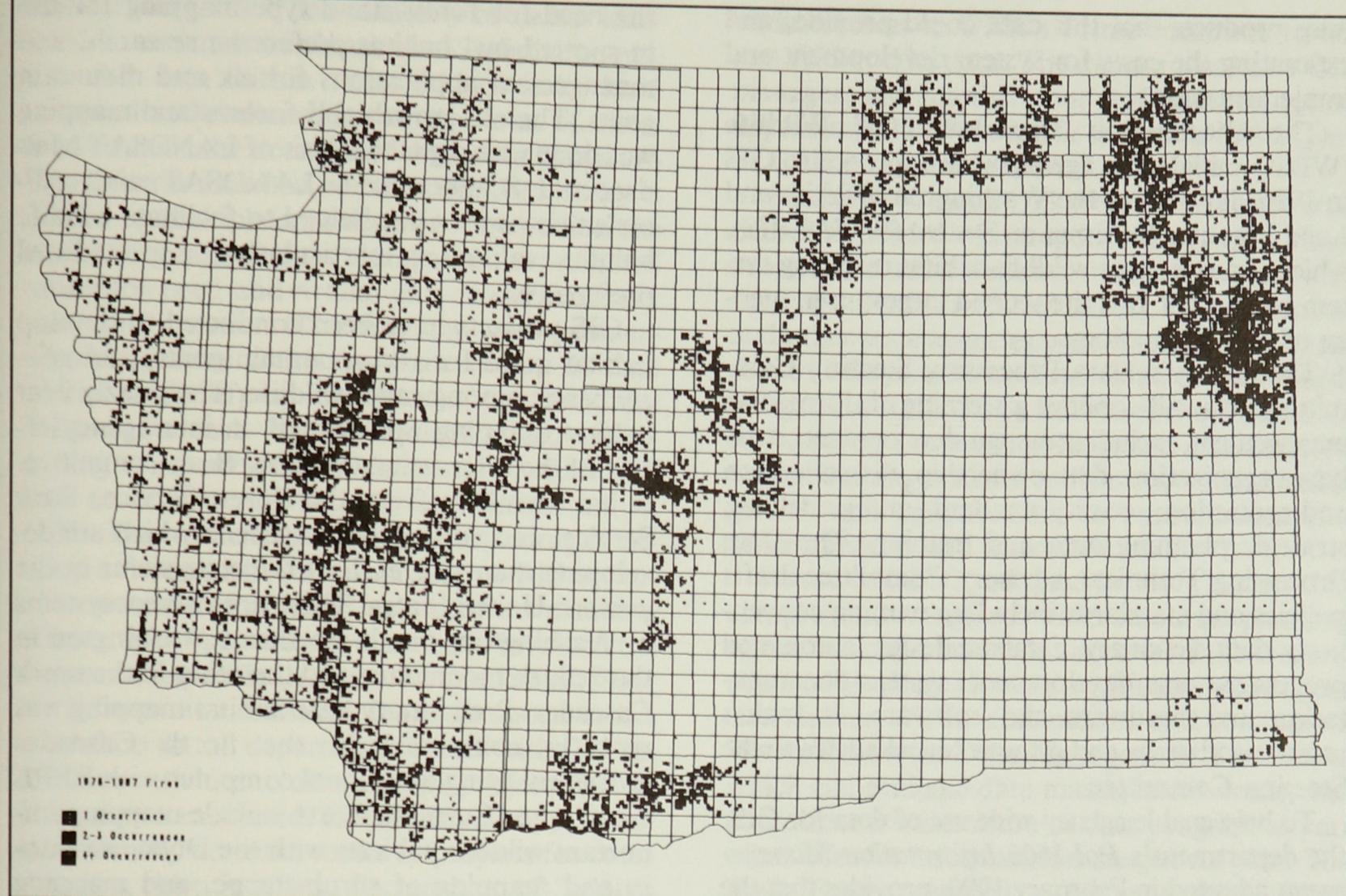
The **Soils** data layer includes all soils boundaries on state and private forest lands, with current efforts to add other soils. The forest soils data was originally derived from the Private Forest Land Grading Program and subsequent soils surveys. A five-year mapping program was completed in 1980 for forest land taxation. This work was conducted with SCS, USFS, and Washington State University, and 1100 townships wholly or partially contain digitized versions of this data. IMD is responsible for the soils data layer, and maintenance activities include correcting existing errors, keeping the boundaries consistent with other data in the system, maintaining the soil

descriptions and adding new soils data in selected areas. Efforts are underway with SCS to complete all soils data. The Geographic Information Section finished digitizing Whatcom County's soils data as part of an SCS cooperative agreement. Additional counties may be digitized in the future. When complete, the soils data will be managed and maintained by the Forest Land Management Division in DNR.

DNR's database is not in the public domain, and is proprietary by state law. DNR's GIS has an on-line data documentation system that is used to record descriptions of data items and associated codes, data files, data layers, and the relationships between these objects. IMD has, when possible, developed standard digital geographic data products. An array of marketable products and services are providing a nominal income to the trust. Most of the data is available for sale to the public through DNR's central Photo and Map sales office in Olympia. Each region also has their own data needed to support requirements unique to that region. A department air photo, and resource mapping program has been in place since before 1965. This activity supports the department and the public with extensive air photo, orthophoto, and mapping products across the state. A data license agreement was developed to enable licensees to use data, but not to copy or distribute it (see **Documents Excerpts**).

The department is involved in many new geographic information development activities, but funding support is limited based on available funds. The largest current effort is the **Transportation and Hydrographic Data Layers** development project at the 1:24,000 scale for approximately 65% of the state. The project involves the updating of this data for the 1100 townships including state and private forest lands. The total effort is a \$1.5 million project begun in 1987, and expected to be completed by the end of 1992. The data will be used for the purpose of evaluating timber harvest and other activities that are regulated by the Forest Practices Act. The Engineering Division will use the transportation data to build a road maintenance system.

The **Forest Land Management Division** (FLMD) has taken the lead in the strategic design of a new **Forest Resource Information System** (FRIS) partially available through GIS. This project was undertaken to provide consistent and reliable stand level tree and volume data that can be sorted, summarized, and recombined to answer various questions. The new inventory information will provide extensive data for better informed management decisions, site-specific tree and vegetation data, and some data for non-timber resources. It will assist in planning, marketing of



timber and other resources, and protection and conservation of resources. IMD provides technical consultation and ensures that the focus and design will not preclude integration of non-forest inventory information in the future.

Planning is in process for several new projects in DNR. The **Land Records Modernization Project** is in the requirements analysis stage. This project will continue with planning and design through FY 1993. It involves automation of agency ownership records, survey records and lease documents. The project is expected to involve integration of geographic information and document retrieval image processing technologies, and will be linked with POCA. The land records and related materials that are part of this project include lease and sale jackets, tract books, marine plates, public land survey records, and state land survey records. Done as a separate project, it may cost \$10 million over five years.

A **Timber Harvest Planning System** has been under development since FY 1989 to help DNR in the advance planning of timber harvests, and monitoring and reduction of environmental impacts of forest management activities. The system will assist DNR to significantly increase income after expenses on timber sales by decreasing timber harvest-related expenses, such as road construction, log hauling costs, and extraction costs. System design and construction is underway, including acquisition of equipment and installation

and operation of field teams. This \$1.7 million effort will add up to ten staff positions in the regions to conduct the work.

The **Forest Practices Application (FPA) Management System** will update DNR's current automated system that tracks the status of FPA activities, but does not allow for complex queries or analyses. Landowners and/or operators on state and private forest land must file application with DNR before they proceed with forest practice operations. DNR has statutory responsibility to ensure that these practices do not significantly impact public resources and at the same time provide for the long-term viability of the timber industry. The system will use the agency GIS to store, analyze, and display FPA information, and to reduce time and complexity of permit processing. The total project is expected to cost \$8.5 million over five years.

The **Aquatic Lands Mapping Project** has been undertaken to conduct research and to automate much of the data relating to aquatic lands in the state. The Aquatic Lands division has acquired a workstation for GIS that includes image processing capabilities. The project involves testing various sources and methods of capturing aquatic ownership data for three selected geographic test areas, modeling the data with other data themes within the DNR GIS (e.g. hydrography and PLSS) and available for other GIS (e.g. bathymetry and wetlands), identifying the standard reports and

map products that this data could provide, and estimating the costs for system development and implementation.

The **Washington Department of Wildlife** (WDW) initiated an agency-wide approach to GIS in 1986. It operates the Washington Wildlife and Land Resource Information System (WWALRIS), which is a statewide wildlife habitat mapping system using GIS. It is the second largest user agency of GIS technology.

The agency's Data Processing Steering Committee sets all policy governing information management, including system development; database organization; data ownership, dissemination and protection; security standards and guidelines; strategic planning data and training. The Data Processing Technical Advisory Committee drafts policies and standards including naming conventions, data dictionary, database design, automated process systems development, system documentation and hardware and software. It makes recommendations and gives technical advice to the Steering Committee.

To help enable agency-wide use of data for GIS, the department's *Pol-1600 Information Management*, adopted in February 1990, provides that the agency will develop and maintain a centralized data management system, and specifically provides that "the centralized database(s) should interface with ARC/INFO GIS."

WDW's annual budget for GIS is over \$240,000, 88% of which is state funded, plus expenses for staff. The equivalent of almost eight staff positions use GIS in the department, and additional staff will be hired. Various job descriptions are in use, including computer programming series, remote sensing analyst, and wildlife biologist, and all include GIS work in the job specifications. In-house training is provided for field staff on EPPL7.

WDW uses ARC/INFO and MEDUSA on a Prime 6450 and also uses LAS software on SUN workstations. Field staff workers use EPPL7 software on personal computers. Data are downloaded to personal computers via phone lines dedicated for that purpose. WDW accesses data from the U.S. Fish and Wildlife's (USFWS) National Wetland Inventory. Data, including LANDSAT imagery and location of wildlife species, are provided to local governments and other state agencies.

WDW has been a primary user of remote sensing data since the mid-1970s. For example, a study of old growth in western Washington was conducted using LANDSAT imagery. This old growth and forest stand mapping effort was initiated in 1986 as part of the department's Remote Sensing Program. The main reason for this project was

the need for forest stand type mapping for use in spotted owl habitat preference research, and management applications for elk and mountain goats. The old growth and forest stand mapping was done with digital analysis of LANDSAT Multispectral Scanner data. LANDSAT and radiotelemetry with GIS, helped to facilitate wildlife habitat evaluations, particularly for spotted owl preference.

GIS projects have been conducted to develop habitat maps for elk, mountain goats, and grizzly bears, among other wildlife. The grizzly bear habitat mapping was part of an interagency effort of the International Grizzly Bear Committee. It has members from the Forest Service, Park Service, and various state agencies which are developing maps for each of the ecosystems in the western United States. There are two ecosystems in Washington, one in northeast Washington in the Selkirk mountains, and the other in the north Cascades. Preliminary bear habitat mapping was recently completed in the north Cascades ecosystem using a personal computer with EPPL7 software. Current efforts include mapping important wildlife habitats with the DNR, inventory and mapping of shrub-steppe, and mapping wetlands with the USFWS and state Department of Ecology.

Early in 1990 the department prepared a proposal to DIS entitled *Sharing Geographic Information: A Proposal to Examine the Feasibility of Linking Department of Wildlife and Department of Natural Resources GIS*. This proposal describes a strategy to implement a high-speed data network between the departments to provide high-speed terminal access, file transfer, and remote access to data across the network. This proposal was not selected for funding by DIS. Following discussions with DIS about the proposal, the department decided to broaden the scope of the project to include all the natural resources agencies, not just WDW and DNR. In addition, the proposers decided to build the business case for sharing data in order to describe the need for sharing data and for identifying which specific data to share.

The result of this effort is a multi-agency project coordinated by the Department of Wildlife. It is designed to identify common data entities and to form the basis for making recommendations on the technical feasibility of sharing data among the participants. Included in the project are DNR, WDW, Ecology, Fisheries, DIS, the State Energy Office, and the Northwest Indian Fisheries Commission.

Each participating agency has identified natural resource data it has and needs to support the agency's business. Each entity is identified as being critical, important or helpful in meeting the agency's

mission and goals. The availability of each is identified as automated or manual and tabular or spatial. All data within these entities have been compiled and evaluated based upon a set of criteria to evaluate the potential for resource data sharing. Criteria included whether the data entity is needed by multiple organizations, how critical the business need is for the data, and the weighted rating for need and availability of electronically stored information. The next step will be to survey the agencies which maintain the top 20 data entities to identify content, format, platform, and software for each. Future inquiries include determining which are the first data areas to share and how to achieve multi-agency administration.

The **Department of Ecology** is beginning to develop a department-wide approach to GIS as part of its overall information management planning efforts. Most activities to date have involved the support of specific projects. In the fall of 1990, its Information Services Division sponsored a workshop for all departmental staff with GIS interest or activities to discuss their projects. Much interest was expressed. It was also an opportunity to identify potential topics or projects for coordination, either in terms of acquisition of facilities or in terms of design of projects. Since then, a subcommittee was formed to act as a coordinator for a continuing directional discussion as to where GIS ought to be going in the department. The goal is to have a balance between coordination and control in order to assure the best use of resources and to achieve a maximum coordination between the various parts of the agency while still not frustrating or discouraging what are locally-based program-oriented efforts that are attempting to get something started. The subcommittee will be considering issues including standards and coordination between projects. The goal is to prompt interest in the programs in GIS and in working together in this regard.

The Executive Management Team is conducting a long-term, agency-wide environmental resources planning effort, known as the Environment 2010 project, which is a state-of-the-environment report required every few years. Plans are to try and characterize, in a geographic format, the quality and character of the state's environment, and to show the potential usefulness of GIS. Information gathered and combined from various parts of the agency can demonstrate the relationship between various hazardous waste sites, water bodies, and withdrawal points for domestic water use by using GIS.

Currently, the department has four 386 computers and two SUN workstations with pcARC/INFO and ARC/INFO software, respectively. These computers are networked. It also has

on-line access to DNR's Prime computer to access GIS and its data. The department has a GIS manager, and another four staff workers spend approximately 25% of their time with GIS as part of their program mission.

A number of small GIS projects have been conducted as needed within specific programs. These projects include a wetlands mapping project with funding support from U.S. EPA. The department and other state agencies were directed to take action to help protect wetlands in an executive order signed in April, 1990. It directed the department to "develop statewide policies and standards on wetlands rating systems, mitigation, buffers, restoration, and enhancement in consultation with other agencies and interested parties."

House Bill 2932, adopted in 1990, directs that comprehensive regional water resources planning efforts be undertaken. It also directs the Department of Ecology to work with other state agencies, Indian tribes, and others, and to create a **Water Resources Data Management Task Force** which can evaluate data management needs, and coordinate a water resource data program as part of an effective information management plan. The Task Force prepared a report entitled *Water Resource Data Management Program: Preliminary Findings and Recommendations*, in September, 1990. It was concluded that a master inventory of the state's surface and groundwater resources is needed. It also found there is "no master set of reference maps or data commonly agreed upon and used to identify and locate the State's water resources." The task force recommended that projects should be undertaken. For example, it suggested the establishment of a standard location system for surface water bodies, and a standard well location system coordinated by the Washington State Geographic Information Council.

The department hired a full-time team leader for the task force in March, 1991. A draft work plan was developed for the following two years, including development of common data architectures, a data inventory, data standards, needs assessments and feasibility studies. A five-year plan will be developed by June, 1992. Over \$1 million is planned to be spent during the 1991-93 biennium on water resources data management planning activities.

Within the department, river water quality studies are underway for basin-specific watersheds, such as the Puget Sound River Basin Project. This project was initiated in 1988 to provide assistance to local government preparation of technical studies, and is funded cooperatively with SCS, USFS and Washington's Department of Fisheries. A Hydropower Planning Database has been

under development since 1987 with federal agencies including U.S. EPA, BPA, the Federal Energy Regulatory Commission (FERC), and the state's Department of Wildlife and Department of Energy, as well as the Northwest Power Planning Council. Water rights adjudications are a related application area. A proposed application involves assisting in mapping and modeling floodplains with state funding, and storing and retrieving National Wetlands Inventory digital files. Some shoreline mapping is underway, as well as a bio-assessment project. Another project is determining the incidence of air pollution control in relation to discharge sources of major population centers.

Data development and some applications development is coordinated with local USGS and U.S. EPA offices. These agencies provide access to their GIS facilities as well. Data funded by BPA, USFS, BLM, and BIA is used by the Department of Ecology and other state agencies. It is anticipated that digital copies of National Wetland Inventory files will be provided to local agencies during 1991. Maps and reports are provided to local agencies as part of the Puget Sound Management Plan.

The **Puget Sound Water Quality Authority** has a two-fold interest in GIS. One is to develop a tool on a broad scale in order to look at conditions in the Puget Sound Basin; the other is to help facilitate GIS development for other agencies that are involved in managing Puget Sound resources. The Water Authority initiated and chaired the Washington State Geographic Information Council's Estuarine Issues Work Group. The authority buys GIS support services from other organizations such as DNR and USGS, and works with the U.S. EPA.

Initial GIS work was conducted with U.S. EPA funding as part of the Puget Sound Estuary program. At that time the Puget Sound Ambient Monitoring Program Steering Committee recommended to the authority that the process of developing GIS be undertaken. It was agreed to develop information at a scale of 1:100,000 that could be used to provide information on resources, demographics and environmental conditions in the entire basin.

The authority hired USGS to convert a tape version of the 1987 Puget Sound Environmental Atlas into ARC/INFO format. When the work was completed, the authority arranged for the database to be given to DNR to run on their system and to use DNR's staff resources. DNR has been producing test plots. The authority hired a geographer under a personal services contract to clean up the data. A pilot test was conducted for the Stillaguamish Watershed with DNR and 14

other organizations as part of efforts conducted with the Northwest Land Information System Network.

Since then, most work has been funded by U.S. EPA. A Puget Sound GIS Working Group was established that includes GIS experts from state and federal agencies, private firms, and tribes. GIS were recommended as a way to provide information on resources, demographics, and environmental conditions, including maps of differing types as needed; for example, the Puget Sound Ambient Monitoring Program.

Statistical summaries and reports, such as the Puget Sound Environmental Atlas, are being produced and updated using GIS. Digital data was developed from a two-volume document called the Puget Sound Environmental Atlas. The Atlas was published in 1987 and data in it has been converted to ARC/INFO format so that it can be used for analysis. Efforts are underway to update and republish the Environmental Atlas. The updating process is being used as a way of getting better data into GIS.

Maps and reports are provided to local agencies in support of the implementation of the Puget Sound Management Plan. Design provisions enable digital data exchange with federal, state, and local databases. Digital data is being developed at a scale of 1:100,000 by staff of the USGS Portland, Oregon office on a 50/50 cost share project, with U.S. EPA paying the state's portion. The subject is being coordinated with the data management activities of the 1990 Growth Management bill.

The **Washington State Department of Agriculture** (WSDA) uses GIS in the U.S. Department of Agriculture (USDA) and U.S. EPA, and has no plans for agency-owned capability. It is a key agency involved in the Pesticide Application GIS demonstration project with DIS, Washington's Department of Ecology, and the U.S. EPA (see Department of Information Services).

The **Department of Fisheries** has one personal computer operating with pcARC/INFO software in the Marine Fish Program to support the Timber, Fish and Wildlife Program. It is used for fishery habitat mapping and resource distribution. The department does not have any staff or funds dedicated for GIS.

The **Department of Health** was created in July, 1989. It is using MapInfo software to track cases of disease for disease control applications, health planning, and research and policy purposes.

The **State Parks and Recreation Commission** is beginning to use MapInfo software. During 1990, the commission began acquiring some data from the Department of Fisheries, including shell fish population and harvest information along

ocean beaches. The data is especially useful for park facilities located along the ocean and along Puget Sound. Data is also being acquired from the Department of Health regarding water quality. Various plans are underway, including conducting some shellfish population surveys in relationship to the tides and some additional experimentation with the GIS data obtained.

The **Department of Energy** uses ARC/INFO on a Micro VAX computers. It has a two-person staff working with GIS. Beginning in 1989, the department has conducted two primary projects. It is the coordinating agency for the State Hydro (River) Study. Other natural resources agencies including DNR, Wildlife, and Ecology are also project participants. Completed on June 30, 1991, the study includes a series of maps and supporting data including archaeological sites, ecologically sensitive sites, and others.

Energy is the lead agency for a project in conjunction with the Bonneville Power Administration and with Idaho, Montana and Oregon. This effort is generating a resources database that includes a map of all potential generating resources within those states, including hydro, wind, solar, geothermal, and co-generation. Generating potential is being mapped, as well as the cost to develop that potential, and proximity to transmission lines or substations for future planning to bring resources on-line.

Energy is also working with the Superintendent of Public Instruction (SPI) to optimize school bus routing for all of the state schools to reduce bus gasoline costs (see below). The department is also working with the Department of Ecology and others on the water resource data management program (see Department of Ecology).

One of the functions of the **Office of Financial Management** (OFM) is serving as the official state census data center. It distributes Census data to an affiliate network of users at the local level, including universities throughout the state. The TIGER line files have been acquired, and OFM has worked with users to learn the files, and to distribute them. OFM is responsible for preparing annual estimates of the state's population, and periodically provides forecasts of the county population and the population of the state as a whole. Forecasting is done for education enrollments, social services, criminal justice, and also some labor market forecasts. Geographically-based information is helping to conduct some estimates and forecasts, with plans to conduct such work at more detailed levels.

OFM acquired pcARC/INFO software in 1989, and is using it to help maintain political boundaries and socioeconomic information, as well as for supporting forecasting functions. OFM is plan-

ning to provide 1990 census data in ARC/INFO and other GIS formats. Boundaries for school districts and community service office service areas for the Department of Social and Health Services (DSHS) have been digitized. Efforts are underway to load the database with administrative data associated with those boundaries. This work has been conducted in cooperation with the Superintendent of Public Instruction (SPI) and DSHS (see below). In addition, discussion is underway with the Department of Revenue about the feasibility of getting data associated with special taxing districts and the possibility of digitizing some of those special district boundaries that can then help in forecasting and analysis.

The **Department of Social and Health Services** (DSHS), Office of Research and Data Analysis (ORDA), has used ATLAS and SAS software since the late 1980s. These systems were used for descriptions of local areas for a variety of policy, planning, and management purposes. Currently, ORDA is conducting a project through which a fiscal year of client, service, and cost data for all DSHS programs will be incorporated into a GIS database using ARC/INFO and SAS. This system will contain information on approximately 800,000 persons participating in 160 social and health programs. The system is anticipated to be operational early in 1992. It is not certain that the project will be continued beyond the initial year. ORDA is also working with the Office of Financial Management (OFM) to digitize rural zip code boundaries.

The **Employment Security Department** (ESD) has had GIS as an agency priority since 1987, but funding support has been unavailable for any large efforts in this regard. Interest in GIS is due to the variety of administrative data that can be referenced by location, including employer names, addresses, their industrial classifications, and some other information about employers, as well as individuals who file claims for unemployment insurance. Both of those sources of data can be brought together geographically through street addresses. Much accomplishment has been made conceptually to link and represent this information using GIS, and the agency is among the more advanced state agencies of its kind.

ESD purchased MapInfo software to begin matching street addresses for this administrative data. Since urban areas have been fairly stable over the last 20 years, about 50% of the street addresses can be easily digitized, while the remaining data requires some editing and checking. ESD recently designated a full-time staff person for GIS, and efforts are underway to geo-reference data at the sub-county level, including the establishment of transportation zones. A current project involves

supporting growth management efforts with the Department of Community Development which is evaluating the closure of military bases.

The **Superintendent of Public Instruction** (SPI) is working on two GIS projects. The first is in cooperation with the U.S. Department of Education and the Census Bureau, which is developing a digital version of school district boundaries on a nationwide level. It is also working with school districts and supporting their use of GIS. Another project is in cooperation with the State Energy Office to optimize school bus routing for all state schools. The objectives of the project are to reduce bus gasoline costs by optimizing school bus routes, thus reducing fuel costs by five to ten percent. The system is called Edulog, a unique system designed specifically for school bus routing that is personal computer-based.

The **State Library** is actively involved in Washington's geographic information efforts. It is an affiliate of OFM's Census Data Center, and is providing Census data on compact disk. The State Library is also involved in coordinating Washington's access to the NWLISN spatial database and is an Earth Sciences Information Center affiliate with USGS. The Library will be the repository for the state's Spatial Data Index (see **Coordination Efforts, Groups and Activities**, Federal and Pacific Northwest Relations). Plans are to acquire mapping software to allow geographic displays of federal statistical information (i.e. census data shown in map format using standard census geography).

The **Department of Community Development** (DCD) is the implementing agency for the comprehensive *1990 Growth Management Act* which requires specific cities and counties to conduct planning activities, including development of comprehensive plans (see **Coordination Efforts, Groups and Activities**, Regional and Local Government Relations and Programs). In this role, DCD is serving as an integrating agency of natural resources and socio-economic data held by state and other agencies. Socio-economic data for use with GIS is being developed by social and human services agencies. Such administrative data from tabular databases are planned to be merged with Census Bureau TIGER files. This work is being conducted primarily by Washington's Employment Security Department (ESD), the Office of Financial Management (OFM), and the Department of Social and Health Services (DSHS), which are currently updating these data. These agencies regularly disseminate data to local governments, and they plan to help use GIS in this regard.

The act and its authorized grants and technical assistance are also stimulating coordinated approaches within and among local governments. A

common land classification system is being developed for use by the assessors. DCD convened a technical assistance group which includes representatives of other state agencies and local governments and which helps to leverage other state government GIS activities. It is working with the Washington State Geographic Information Council in its efforts.

DOT is using GIS to identify, inventory, and map wetlands with aerial photography within its rights-of-way and other facilities.

The **Department of Transportation** (DOT) has a Geographic Services Branch to centralize and coordinate all geographic information activities. A GIS technical coordinator position was created in 1990. The role of this coordinator is to develop products and specific demonstrations that show the utility of GIS within the agency. An Intergraph system is used for CAD and GIS efforts, including aerial photography, photogrammetry, cartography, and surveys using GPS. Current efforts are digitizing state highways, with some informal coordination with DNR in this regard (see above).

No formal GIS is in place to pull all Washington DOT geographic information together, but the technical staff have promoted GIS to executive management. A two-phase GIS feasibility study was conducted in 1989 and 1990. It included a review of current conditions, options, cost considerations and recommendations. Major resources have not been allocated for GIS development; rather an incremental implementation approach has been adopted.

DOT is using GIS to identify, inventory, and map wetlands with aerial photography within its rights-of-way and other facilities. One of the few state departments of transportation with such an effort, the Washington DOT is using U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) tapes as a preliminary overview of an area. Following this review, the DOT staff is mapping wetlands at the 1:5,000 scale using DOT photography and contributing the data back to NWI. This work is being informally conducted in cooperation with the Department of Ecology.

Other agencies are using and planning to use GIS technology. For example, the **Washington Utilities and Transportation Commission** is using AtlasMAP software on a 286-based personal computer to track information on telecommunications companies. The Department of Trade and Economic Development is considering GIS to

produce maps of the locations of industrial sites, and the State Board on Community Colleges is also considering use of GIS.

The **Washington Redistricting Commission** (WRC) was charged with creation of a system to delineate Congressional and Legislative districts based upon the 1990 census. A major aspect of this system is the distribution of geographic and population information back down to counties and local governments. Redistricting also requires the consideration of political information plus the precinct boundaries, which will be provided to counties and local governments for their redistricting efforts. Redistricting plans were to be done by the end of 1991 for consideration in the 1992 legislative session. In support of this activity, WRC contracted to have the TIGER/line data edited and upgraded as much as possible. This data will be available for both the legislative and executive branch agencies. Other socio-economic data is being acquired from executive branch agencies for use in the decision making process. WRC is also actively participating in the Washington State Geographic Information Council's efforts.

Seven VAX workstations are used including one for each of the four Legislative Caucuses and three for the commission. All systems will be capable of running the three redistricting software applications. PSA's Plan90 software is the primary geographic redistricting system. ARC/INFO is being used to evaluate geographic information, since it has the capability to overlay non-related data layers. SPSS software is being used for statistical evaluation and for graphic representation other than maps.

Academic Activities

Central Washington University's Central GIS program began in 1983, when the U.S. Army asked for help to develop GIS applications for archaeology at the Yakima Firing Center. Since then, the GIS Laboratory has become an interdisciplinary facility for graduate and undergraduate education, with students drawn from departments such as Biology, Geology, Geography and Sociology. With a new campus-wide fiber optic network, remote GIS terminals are being established in several locations across campus. Short courses are taught for professionals in government and industry; and extensive GIS database development has been performed with the Timber-Fish-Wildlife planning process for the Yakima River Basin. Primary GIS software is GRASS (Geographic Information Analysis Support System), developed by the U.S. Army. The university may become involved in cooperative projects with Kittitas County and the City of Ellensburg. The university represents academia on the Washington State Geographic Information

Council.

The **University of Washington** uses GIS in a variety of academic disciplines, including the Departments of Geography, Urban Design and Planning, Landscape Architecture, Civil Engineering, Forest Resources, Oceanography, and Botany, and the Graduate School of Public Affairs. GIS is used for research and educational purposes, and an informal coordination group exists among user departments. The university cooperates with federal agencies, and some facilities have grants, such as for testing data quality with the National Science Foundation. A variety of GIS software programs are in use. In addition, **Washington State University** has worked with state agencies regarding GIS and image processing. These institutions and **Western Washington University** use GIS for education and research purposes.

4

Documents List

Directives

Engrossed Substitute House Bill No. 2929, **Growth Management Act**, 1990.

The comprehensive *1990 Growth Management Act* requires specific cities and counties to engage in a wide range of intra- and inter-jurisdictional planning activities, including development of comprehensive plans. Its provisions include requiring certain high growth and populated counties (and allowing other counties) to designate urban growth areas and conduct capital facilities planning efforts. Comprehensive plans must include public facilities, utilities and transportation elements, with zoning and other implementation regulations also required. The act directed the Department of Community Development to develop a program to assist local governments in conducting planning efforts required by the act. The act also required the department to "assist in the process of inventorying and collecting data on public and private land for the acquisition of data describing land uses, demographics, infrastructure, critical areas, transportation corridors physical features, housing and other information useful in managing growth in the state. For this purpose the department shall contract with the department of information services and shall form an advisory group consisting of representatives from state, local and federal agencies, colleges and universities, and private firms with expertise in land planning and GIS."

(The following directives were adopted by the legislature for the Department of Natural Resources (DNR) beginning in 1973 with amendments):

Chapter 58.22.020, which provides that DNR “shall establish and maintain a state base mapping system,” and also defines standards for the system.

Chapter 58.24.020 provides that the “division of engineering services of the DNR is designated as the official agency for surveys and maps.”

Chapter 79.68.120 specifies that the “DNR shall design expansion of its land use data bank to include additional information that will assist in . . . land use, population growth, and . . . influence the quality of the state’s environment.”

Agreements

Memorandum of Understanding Between the Washington Department of Natural Resources and the Washington State Department of Transportation, 1989.

This agreement provides that the Department of Natural Resources and the Washington State Department of Transportation will meet quarterly, and it also identifies opportunities for cooperation and benefits to both agencies. It provides that the agencies will cooperate in general and in the coordination of products and services.

Cooperative Program: A Computerized GIS for Land and Water Resources Analysis and Management in Washington, Department of Natural Resources, Department of Ecology and U.S. Geological Survey, 1985.

This is a work share agreement for digital data development for water resources and for database development criteria for standards, and other aspects of data development.

Memorandum of Understanding To Develop Compatible Data Base Management and Inventory Systems in the State of Washington Between the U.S. Forest Service, Washington Department of Natural Resources, and other Agencies, May, 1982.

This agreement established statewide guidance for plans and programs for interagency data management and inventories between state and federal agencies through a joint state/federal working group. It was signed by 11 state agencies, including the Washington Legislature, and eight federal agencies.

Reports/Publications

Washington State Geographic Information Council, Charter and Bylaws, Revised June 12, 1991.

This document is the charter and bylaws adopted by the Washington State Geographic Information Council. It describes that the purpose of the council is to “provide direction for automated geographic information needed to improve the delivery of government products and services in the State of Washington.” Its goals include identifying issues; recommending actions; fostering

cooperation among all levels of government, tribal and private entities; formulating and recommending standards for data architecture, quality, accuracy, resolution and maintenance; promoting sharing; and serving as a forum for the exchange of educational information and development of mutual interests. It provides that voting members are representatives of state, regional and local governments; ex-officio members are (one each) from the federal government as designated by the U.S. Geological Survey, private sector; and one representative from the Washington Department of Information Services. Two ex-officio members are to be selected by the tribes. The document provides for officers and their election and duties, committees, meeting procedures and other administrative provisions.

Water Resource Data Management Program: Preliminary Findings and Recommendations, Washington Department of Ecology, September, 1990.

This report was prepared as directed by House Bill 2932, adopted in 1990, which requires that comprehensive regional water resources planning efforts be undertaken. It directed the Department of Ecology to work with state agencies, Indian tribes, and others, to create a Water Resources Data Management Task Force to evaluate data management needs, and to coordinate a water resource data program as part of an effective information management plan. This report includes the task force’s initial recommendations. It was concluded that a master inventory of the state’s surface and groundwater resources is needed. It also found there is “no master set of reference maps or data commonly agreed upon and used to identify and locate the state’s water resources. Such an inventory is a fundamental need of all organizations involved in water resource policy making, planning and management.” The report recommends projects to be undertaken; for example, the establishment of a standard location system for surface water bodies, and a standard well location system coordinated with the Washington State Geographic Information Council.

Available GIS Training, Washington Department of Natural Resources, Division of Information Management, June 1990.

This document provides a listing of courses available from the Department of Natural Resources’s Division of Information Management. It includes daylong courses in Introduction to Primos and GIS, Info I, ARC Concepts, ARCEDIT, ARC Commands, ARCPLT, Advance Display: Custom Map and Report Creation, and INFO II. A list of available self study courses is also included.

Implementation Plan for the Puget Sound GIS,
Puget Sound Water Quality Authority, March,
1990.

The Puget Sound Water Quality Authority authorized development of GIS in June, 1989. A cooperative agreement between the U.S. Environmental Protection Agency Office of Puget Sound and the Authority resulted in the processing of data for a test area. Work was conducted by the USGS Portland, Oregon office and a Puget Sound GIS Working Group, including GIS experts from state and federal agencies, private firms, and tribes. This document describes progress to-date, and identifies data and conversion needs and organizational arrangements, including alternatives for system housing and maintenance, costs, and other issues.

Final Report Recommendations on Developing GIS for Puget Sound and Updating the Puget Sound Environmental Atlas, Puget Sound Water Quality Authority, May, 1989.

This report recommends creation of GIS to provide information on resources, demographics, and environmental conditions in the Puget Sound Basin at a scale of 1:100,000. GIS was identified as a method to produce maps of differing types as needed, to map Puget Sound Ambient Monitoring Program data, and to produce statistical summaries and conduct analyses of geographic data. The Puget Sound GIS would help produce information for reports and help update the Puget Sound Environmental Atlas. Design provisions included enabling digital data exchange with federal, state, and local databases.

Pesticide Application Record Data Base Phase I: Data Base Design Final Report, U.S. Environmental Protection Agency, Region 10, Seattle, Washington, 1990.

The Washington Legislature passed House Bill 2222 in April 1989, requiring pesticide applicators to keep records concerning the application of pesticides. The U.S. Environmental Protection Agency, Region 10, initiated the Pesticide Application Record Data Base Project with the Department of Agriculture in June of that year to facilitate the use of these data by state agencies involved in resource evaluation efforts and management decision processes. The overall purpose of the project is to design (Phase I) and demonstrate (Phase II) the utility of a spatially-oriented pesticide application database. A design requirement was that the database system be able to provide information that can be used with GIS to allow pesticide data to be combined with other data layers, such as hydro-geological susceptibility maps or public water supply well locations. Phase I was completed in early 1990, and Phase II is scheduled to be completed in February, 1991. Phase II will test and

evaluate the database and record collection system, as well as demonstrate the utility of the database for pesticide management and resource evaluation.

Sharing Geographic Information: A Proposal to Examine the Feasibility of Linking Department of Wildlife and Department of Natural Resources GIS, Submitted to Department of Information Services as a Strategic Initiative Proposal, Washington Department of Wildlife, March 30, 1990.

This proposal describes a strategy to implement a high-speed data network between the Department of Wildlife and Department of Natural Resources and their GIS to provide three functions. These functions include high-speed terminal access, file transfer, and most importantly, remote access to data across the network. Implementation testing of the network proposed would involve integration of spatial data managed separately by the two departments, yet still used together within the context of the Timber, Fish, and Wildlife Agreement.

Pol-1600 Information Management, Washington State Department of Wildlife Policy, February, 1990.

This policy explains that the Data Processing Steering Committee sets all policy governing information management, including system development; database organization; data ownership, dissemination and protection; security standards and guidelines; strategic planning data and training. It states that the agency will develop and maintain a centralized data management system, and specifically provides that "the centralized databases should interface with ARC/INFO GIS."

The Status of Old Growth in Western Washington: A LANDSAT Perspective, Eby, James R. and Michele C. Snyder, Washington Department of Wildlife, January, 1990.

This report summarizes the results of the Department of Wildlife old growth and forest stand mapping effort, initiated in 1986 as part of the department's Remote Sensing Program. The main purpose of this project was to provide forest stand type mapping for use in spotted owl habitat preference research, and management applications for elk and mountain goats. The study area for this project was 11.3 million acres and this included two regions of western Washington: the western slope of the Cascade Mountains and the Olympic Peninsula. The lands within the study area were divided into major ownership categories by digitizing administrative boundaries. Elevation zones were identified using digital terrain data. The old growth and forest stand mapping was performed with a digital analysis of LANDSAT Multispectral Scanner data.

GIS Feasibility Study Phase I and II, Washington Department of Transportation, Planning, Research and Public Transportation -Geographic Services Branch, 1990.

These reports were prepared to develop a plan for GIS in the Washington State Department of Transportation (WSDOT) on an agency-wide basis. Phase I summarizes the results of a study conducted to determine the feasibility of implementing GIS. This study was undertaken to assess the "state of the art" of GIS for transportation, to determine some common definitions and level of understanding of GIS, and to coordinate fragmented GIS efforts in the Department. A review of current conditions, options, cost considerations and recommendations was provided, including the recommendation that a strategic direction be established. It also states that "project goals are to include expanded WSDOT user and management awareness, understanding, and involvement. Projects currently underway within WSDOT will be coordinated and monitored, and a more in-depth examination of GIS technology will be pursued."

Strategic Directions for Information Technology in Washington State Government, Department of Information Services, June, 1988.

This document describes the state of Washington's strategic directions for acquiring, managing and using information technology, defined as the equipment, software, services and products used for information processing, office automation, and telecommunications.

Paper

A Methodology to Identify, Inventory, and Map Wetlands Using Aerial Photography and GIS, Chaplin, Bernie, et. al., Washington State Department of Transportation, December, 1989.

This paper proposes that the Washington State Department of Transportation should initiate an inventory of wetlands within its rights-of-way and other facilities. It describes the need for large scale maps, such as the 1:100 scale, and a database and method to catalog, store, access, and modify this information. A study is proposed to determine to what extent this information can be stored in a database, then used to create a digital map and incorporated into a GIS.

Natural Resources Management Drives the Washington Department of Natural Resources' GIS, Reinhard, Christine, Division of Engineering, and Larry Sugarbaker, Division of Information Management, Department of Natural Resources, November, 1989.

This paper presents an overview of the functions of the Department of Natural Resources as they relate to GIS, a developmental history of GIS

in the agency, and a description of the current system and data resources. It also discusses benefits in the agency, the DNR's role in the evolution of a statewide system, and issues associated with developing a corporate database and service center. Lessons learned regarding funding, staffing, RFPs and data development are also provided.

A Framework for Model Curricula Development in Cartography and GIS, Nyerges, Timothy L. and Nicholas R. Chrisman, University of Washington, Professional Geographer, 41(3), 1989, pp. 283-293.

This paper presents an integrated instructional program for cartography and GIS in the Department of Geography at the University of Washington. It is based on a conceptual framework that consists of a matrix of instructional topics cross-listed by courses. Values in the matrix cells represent the depth of treatment for each topic within a course. The paper reports that "the instructional program development process suggests that such a framework might be useful in model curricula development as well as departmental instructional program development."

Wildlife Habitat Analysis Using LANDSAT and Radiotelemetry in a GIS with Application to Spotted Owl Preference for Old Growth, Young, T.A., et al., Washington Department of Wildlife, Proceedings: GIS'87 -San Francisco, October, 1987.

This paper explains a system that was developed to facilitate wildlife habitat evaluations. The system includes three subsystems including conversion of LANDSAT vegetation cover into an ARC/INFO polygon coverage; development of an ARC/INFO point coverage of animal radiotelemetry locations; and overlay, analysis, and reporting. An application of spotted owl preference for old growth forest types is presented as an example of the system process.

The Use of Sun Incidence Angle and Infrared Reflectance Levels in Mapping Old-Growth Coniferous Forests, Eby, J.R., Washington Department of Wildlife, Proceedings: ASPRS-ACSM Fall Convention, Reno, Nevada, October, 1987.

This paper reviews a method for investigating and using the relationship between sun-incidence angle and near-infrared reflectance levels for mapping old-growth coniferous forests with Landsat data in Washington State. Changes in sun-incidence angle related to mountainous terrain variations caused changes in the reflectance levels of infrared light from coniferous forests as sensed by Landsat. Analysis of field observations, Landsat data, and digital terrain data was used to model this relationship to enhance the mapping of old-growth stands.

Document Excerpts

PRODUCT LICENSING AGREEMENT TERMS AND CONDITIONS

This Agreement is a license and is made and entered into by and between the State of Washington, acting by and through the Department of Natural Resources (hereinafter referred to as "DNR"), and the client identified on the reverse (hereinafter referred to as "User").

Whereas, DNR is the designer and developer of the product(s) specified in the agreement (hereinafter referred to as "Product") with the right to license and distribute the Product; and

Whereas, the User is an individual, an organization, a corporation, a government entity or a member of a joint venture who will make use of the Product in its business activity; and

Whereas, the User desires a license to use the Product and the DNR desires to grant such a license to the User for the sole purpose of permitting the User to use the Product in its business activity and for no other purpose whatsoever;

Now, Therefore, in consideration of the mutual terms, covenants, and conditions set forth herein, the parties hereto agree as follows:

1. Product

1.1 Licensed Product(s). This license applies to the Product(s) as listed on the reverse side hereof.

1.2 Grant of License. For and in consideration of the User's covenant to make payments under Section 5 and the performance of the other covenants and obligations of the User hereunder, the DNR hereby conveys to the User a nonexclusive license to use the Product.

2. Use

2.1 Permitted Use. This license is granted for the sole purpose of permitting the User to use the Product in its business activity and for no other purpose whatsoever.

2.2 Restrictions on Use.

(a) Unauthorized Use. User shall not use the Product on behalf of any other person or organization (including, but not limited to, networks, timesharing, or multiple CPU arrangements) unless authorized in writing by DNR.

(b) Copies. User shall not duplicate the Product except for the following:

1. User may make one copy of the Product for protection purposes as long as the User agrees not to use the backup copy for any purpose other than to replace original data if lost or damaged.

2. User may translate the Product into other formats and/or media. These "reformats" shall be subject to the same restrictions as the Product under this agreement.

2.3 Reserved Rights. DNR shall retain all rights, title and interest in the Product, including the right to license the Products covered by this license to other users.

3. Maintenance of Digital Data

3.1 Annual Update. DNR agrees to supply a data update service for digital data for an additional fee. The data shall consist of one annual update of licensed digital data unless otherwise specified. DNR will provide updates in its then current format.

3.2 Periodic Update. DNR agrees to supply updates of the licensed digital data in addition to the annual updates for an additional fee.

3.3 Cancellation. The user agrees that if the update option is canceled by the User the update option cannot be resumed.

4. Term

4.1 The term of this agreement shall not be restricted as to time, except as set forth in 4.2 below, and shall commence the date the agreement is executed.

4.2 The term of the license shall expire at such time as the User discontinues use of the Product unless the User fails to comply with any of the terms and conditions provided herein at which time the license shall be revoked. The license shall be revoked by DNR giving written notice of such revocation to the User.

5. Payment

5.1 Time for Payment. Initial payment of fees shall be made at the time the license is granted or as set forth in 5.2 or 5.3.

5.2 Annual Update Option. The fees for the annual update option are set by DNR in its sole discretion. The fees are due and

payable annually on the anniversary date of the contract. DNR will notify User at least 30 days in advance of the anniversary date of any change in fees for the following year.

5.3 Periodic Update Option. The fees for the periodic update option are due and payable upon receipt of the product.

5.4 Unpaid Fees. Any fees remaining unpaid more than 30 days after the date they are due shall be subject to an interest charge of 1% per month until paid.

5.5 Sales Tax. All fees are subject to Washington State sales tax unless the User has tax exempt status.

6. Delivery

DNR shall deliver the Product to User pursuant to the following conditions:

(a) DNR shall package, ship and deliver the Product to the User at the address specified in the agreement or a designated alternate address.

(b) DNR shall not assume any liability for shipment of the Product.

(c) The carrier shall not be considered an agent of DNR.

(d) DNR shall choose the method of delivery in the absence of prior shipping instructions.

(e) Dates specified for delivery of the Product shall be postponed automatically if DNR is prevented from meeting those dates by any causes beyond its reasonable control.

7. Limited Warranty

7.1 Limited Warranty.

(a) DNR shall use its best efforts to ensure that the Product is delivered free of physical defect.

(b) DNR shall have the sole authority to determine whether the Product, at the time of delivery, was free of physical defect.

(c) DNR disclaims any other warranties, express or implied, respecting this agreement or the Product.

7.2 Remedy.

(a) User's sole and exclusive remedy for breach of this limited warranty will be to return the Product within 60 days of receipt.

(b) DNR shall, at its discretion, retain the returned Product and refund the fee for the license, or replace the Product, or repair the Product and return it to the User.

8. Assignment and Transfer

User shall not disclose, lease, sell, distribute, make, transfer or assign the Product or engage in any other transaction which has the effect of transferring the right of use or part of the Product without prior written consent of DNR.

9. Liability

DNR shall not be liable for any activity involving the Product with respect to the following:

(a) Lost profits, lost savings or any other consequential damages.

(b) The fitness of the Product for a particular purpose.

(c) The installation of the Product, its use or the results obtained.

10. Termination

10.1 User Rights. Upon the expiration or revocation of this license, the rights of the User shall cease.

10.2 Return of the Product and Copies. The Product and any copies of the Product shall be returned to DNR within 30 days from the date this license expires or is revoked.

11. Miscellaneous

11.1 Applicable Law; Venue. This license shall be construed and interpreted under and pursuant to the laws of the state of Washington. The parties agree that venue for any action or claim arising out of or in connection with this license shall be in the Superior Court for Thurston County, Washington.

11.2 Invalidity. If any term or provision of this license or the application thereof to any person or circumstance shall to any extent be invalid or unenforceable, the remainder of this license shall not be affected thereby, and each term and provision of this license shall be valid and enforced as written to the fullest extent permitted by law.

11.3 Entire Agreement. This license contains the entire agreement of the parties hereto with respect to the matters covered hereby, and no other agreement, statement or promise made by any party hereto, which is not contained herein, shall be binding or valid.

11.4 Authority. Person whose signatures appear as "User" on the reverse represent that they are authorized to do so and represent and warrant that this licensing agreement is a legal, valid and binding obligation and is enforceable in accordance with its terms.